

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN JULY:—

- July 4. Opposition of Juno.
 7. Uranus in opposition to the Sun.
 „ Saturn. Outer minor axis of outer ring = $5''.68$.
 12h. 57m. Minimum of Algol (β Persei).
 12. 9h. 46m. „ „ „
 16. 10h. 59m. to 12h. 3m. „ Moon occults τ^2 Aquarii (mag. 4.3).
 18. 16h. 11m. Saturn in conjunction with Moon. Saturn $3^\circ 2' N$.
 22. 16h. 35m. Western elongation of Saturn's Satellite Titan.
 25. 10h. Mercury at greatest elongation, $19^\circ 50' W$.
 27-31. Epoch of the Aquarid and early-Perseid meteors.
 29. 15h. Vesta $0^\circ 1' S$ of Moon.
 „ Venus. Illuminated portion of the disc = 0.153 .
 30. 16h. Eastern elongation of Saturn's Satellite Titan.

A BRIGHT METEOR.—A magnificent meteor, with a long path and very slow motion, was observed on June 28 11h. 12m. by Mr. Denning at Bristol, and by the Rev. John Brown at Brighton. At Bristol, the apparent course was recorded as from $276^\circ + 23^\circ$ to $1^\circ + 48\frac{1}{2}^\circ$, while at Brighton the object passed just under the stars β and γ of Ursa Major, and just above Cor Caroli, the direction being from β Scorpii.

Mr. Denning has investigated the real path, and found the heights eighty-seven to fifty-four miles over Dorchester, Dorset, to Kington, Warwick. Length of observed flight 123 miles, and velocity $17\frac{1}{2}$ miles per second. Radiant point $240^\circ - 20^\circ$, and about $10^\circ W$. of the usual radiant of the June shower of Scorpiid fireballs. The meteor had a bright train of sparks, and sailed along a considerable arc (70°), the duration at Bristol being estimated as seven seconds and at Brighton six to eight seconds.

COMPUTED MAGNITUDES FOR HALLEY'S COMET BEFORE PERIHELION.—In No. 4254 of the *Astronomische Nachrichten* (p. 99, June 13) Prof. J. Holetschek discusses the probable magnitudes of Halley's comet during the two oppositions which are to come before it arrives at perihelion. Monthly ephemerides show the probable positions of the comet for October, 1908, to March, 1909, according to the assumptions that perihelion passage will take place on May 16, 1910, thirty days earlier or thirty days later, and the geocentric and heliocentric distances are also shown. Then follows the table giving the probable magnitudes for the same period, and also for September and October, 1909. From this we see that for October 2, 1908, the probable magnitude is 18.2, the comet increasing in brightness until, on October 2, 1909, its magnitude should be 14.6.

THE REVISED HARVARD PHOTOMETRY.—We have just received a copy of vol. 1. of the *Annals of the Astronomical Observatory of Harvard College*, in which is published the revised Harvard photometry. This comprises a catalogue of the positions, photometric magnitudes, and spectra of the 9110 stars, mainly of magnitude 6.50 and brighter, which were observed with the 2-inch and 4-inch meridian photometers, in all parts of the sky, during the years 1879 to 1906. Some idea of the magnitude of the work may be gathered from the fact that the observations involved a total number of 1,082,060 photometric settings. In the catalogue itself the stars are given consecutive numbers, and are arranged in order of R.A. as usual. Then follows the designation for each star in other catalogues, the position for 1900, the magnitude, the residuals, and the combination of letters and figures which denotes the spectral type. It is proposed by Prof. Pickering that the abbreviation H.R. shall be used when referring to a star's designation in the present catalogue. Several pages of "remarks", which follow the catalogue proper give valuable notes concerning stars which are in any way peculiar.

THE PARALLAXES OF NEBULÆ.—From a re-discussion of Prof. Wilsing's results for the parallaxes of the two nebulae G.C. 4964 and N.G.C. 7027, Herr Einar Huss, of Stockholm, derives new definitive values which, in each case, show a reduction of the negative values obtained by Prof. Wilsing. For G.C. 4964 the latter observer found

the parallax $-0''.083 \pm 0''.025$, whereas Herr Huss derives the value $-0''.063 \pm 0''.050$; for N.G.C. 7027 the respective values are $-0''.172 \pm 0''.068$ and $-0''.119 \pm 0''.021$. Taking into account the facts that the observations were made at about the same epoch, and that the objects are in the same part of the sky, Herr Huss considers that there is evidence that, of the two, the nebula N.G.C. 7027 is the more remote (*Astronomische Nachrichten*, No. 4254, p. 96).

OCCULTATION OF JUPITER'S SATELLITE II. BY SATELLITE I. In No. 4255 of the *Astronomische Nachrichten* (p. 119, June 18) Prof. Hartmann places on record the results obtained from observations of the occultation of J. ii. by J. i. on February 24. The observations were made with the 50 cm. refractor of the Potsdam Observatory, a power of 450 being used, and the best value for the time of the middle of the conjunction is given as 9h. 45m. $32s. \pm 5s.$ (M.E.T.).

SOLAR PROMINENCES IN 1907.—Prof. Riccò's summary of the results of the prominence observations made at the Catania Observatory during 1907 appears in No. 5, vol. xxxvii. (p. 83), of the *Memorie della Società degli Spettroscopisti Italiani*; the usual data regarding the latitudes, heights, and extensions at the base are given, and the complete results summarised. The mean heliographic latitude, for both hemispheres, was $29^\circ.4$, being 1° less than in 1906; a notable maximum occurred in the third quarter in latitude $80^\circ - 85^\circ$ south. In the northern hemisphere, for the whole year, there were two well-defined maxima (in latitudes $50^\circ - 60^\circ$ and $20^\circ - 30^\circ$), and in the southern hemisphere there were three (latitudes $10^\circ - 20^\circ$, $40^\circ - 50^\circ$, and $80^\circ - 90^\circ$). During the first five months the number of prominences in the northern hemisphere preponderated, but for the last seven months the southern hemisphere showed the greater numbers; the numbers observed for the whole year were 381 and 447 respectively.

THE TEMPERATURE AND STRUCTURE OF THE SUN.—In a lecture delivered before the Philosophical Society of Washington, and now printed as a bulletin of the society (vol. xv., pp. 75-101, May), Dr. O. Lummer gave an interesting and suggestive résumé of our present knowledge concerning the probable temperature and structure of the sun. From a discussion of the laws of radiation as applied to the observed solar values, he arrives at the conclusion that the temperature may, with reasonable certainty, be assumed to be about 7000° . As such a temperature surpasses the critical temperature of all terrestrial substances, Dr. Lummer concludes that a sharp limit between a liquid and a gaseous mass on the sun is physically impossible. On the basis of this conclusion he discusses the probable structure of the sun's envelopes, and finds that most of the spectral phenomena observed, e.g. the broadening of lines in sun-spots and the distortion and displacement of various lines in prominences, can be accounted for by the assumption that they are produced by anomalous dispersion in the various layers of the sun's atmosphere.

THE ROYAL SOCIETY CONVERSAZIONE.

THE annual conversazione to which ladies as well as gentlemen are invited by the Royal Society was held in the society's rooms at Burlington House on Monday. Most of the objects of scientific interest exhibited on this occasion were the same as those shown at the conversazione in May, and already described in these columns (May 21, p. 58). A few additional exhibits may, however, be referred to here to supplement the previous article. As before, we summarise the descriptions in the official catalogue, after arranging together related subjects.

Dr. George E. Hale and Mr. Ferdinand Ellerman: Astrophysical photographs taken at Mount Wilson Solar Observatory, Pasadena, California.—The Director of the Meteorological Office: Zoetrope apparatus exhibiting the progress of a travelling storm-centre and the circulation of air associated therewith. By means of a series of maps, upon which the isobaric lines and corresponding steps of the trajectories are drawn, and an ordinary zoetrope apparatus, viz. a revolving drum with slits through which the

succession of maps is seen, the spectator is enabled to see both processes in progress, viz. the march of the depression and the course of the air in the various parts of the depression.—*Mrs. Hertha Ayrton*: The residual motion of water moving in stationary waves. When a liquid rises and falls in rhythmical wave motion its particles do not simply swing to and fro, returning, like pendulums, to their starting points after each oscillation, but each particle takes up a new position after each oscillation, so that it traces out a path for itself, only returning after many oscillations to the point from which it started. This general movement, which takes place in conjunction with the oscillatory movement, is called the residual motion of the liquid. It takes the form of vortices of peculiar shape, which are exactly the opposite of the ripple-forming vortices to which obstacles under the water give rise, since a single residual vortex is only completed in many oscillations, while each ripple-forming vortex is born and dies in a single swing.

Prof. A. M. Worthington, C.B., F.R.S.: Recent instantaneous photographs of splashes.—*Dr. W. J. Russell, F.R.S., and Mr. O. F. Bloch*: Photographs of flowers, &c., in natural colours (Lumière process).—*Mr. H. G. King and Mr. R. Kerr*: "Master gauges" or "standards" for extremely accurate measurements, the invention of *Mr. C. E. Johansson*, of Sweden. By using these gauges separately or combined together, more than 80,000 different sizes can be obtained, any of which sizes are accurate to within 0.00004 inch at 66° F. The steel is so treated as to reduce to a minimum any chance of change after being hardened. The gauges are used where extreme accuracy is required, as in the manufacture of machine parts, tools, and various instruments; also for "marking off" dies on surface plates and for testing them when machined, &c. Two of these blocks put face to face can sustain a pull of 11½ lb., or 22 lb. to the square inch.—*Mr. Frederick Iles*: (1) "Irisographs," or chemical designs. "Irisography" is a method of producing coloured designs by means of chemical solutions applied in spots upon unsized paper, and subsequently developed by the central application of a compound solution which, spreading by capillary attraction, and coming into contact with the previously applied spots, combines with and reacts upon them to produce designs of varied outlines and colours. (2) "Caleidographs." Original designs executed by aid of the caleidograph on china, glass, paper, and on prepared glass plates. The "caleidograph" is an instrument to facilitate the working out or elaboration of simple or complex designs composed of geometrical curves and lines, either upon paper or on the actual articles of china, glass, metal, &c.

Dr. J. A. Fleming, F.R.S.: Transmission of signals by electromagnetic induction between oscillatory circuits, and their reception by means of a glow-lamp detector. At one end of the principal library a square circuit was set up in which high-frequency oscillations were created by the discharge of a Leyden jar charged by an induction coil. The coil was actuated by a coal-gas mercury break, and the spark was in a silencing chamber with air-blast arc destroyer. The oscillations were cut up into Morse signals by a punched tape and relay in the primary circuit. One hundred feet away was a similar receiving circuit, in which oscillations were created by induction transmitted from the sender, and were detected by a glow-lamp detector or oscillation valve and telephone. Messages and signals thus sent formed a small-scale exhibition of high-frequency inductive wireless telegraphy.—*Dr. Alexander Muirhead, F.R.S.*: A combined Kelvin siphon recorder and cable relay. The latest form of the Kelvin siphon recorder has been converted into a successful cable relay by simply substituting fine gold wire for the silk fibre which connects the siphon to the vibrator.

Mr. Leonard Hill, F.R.S.: (1) Self-contained diving dress (made by Messrs. Siebe, Gorman and Co., Ltd.). Air-pump, pipe, and life-line are done away with, and the diver is connected to the surface by a telephone cable only. Attached to the back of the ordinary diving dress are cylinders containing air with 50 per cent. oxygen. The oxygen mixture is delivered to the helmet by a pipe, to which a reducing valve is attached. The supply is 4 litres per minute, and lasts two hours. Two caustic soda boxes

are connected by a pipe with the helmet, and by a second pipe to an aspirating arrangement placed in the oxygen delivery tube. The force of the oxygen mixture escaping through a narrow jet is used to aspirate the air in the helmet through the soda boxes, which purify it from the exhaled carbonic acid. (2) Life-saving apparatus for use in mines (made by Messrs. Siebe, Gorman and Co., Ltd.). The apparatus, perfected out of that of *Mr. Fleuss*, consists of a breathing bag, and cylinders of compressed oxygen, carried by straps passing over the shoulders, and so hung that the man is free to do work. The dress allows the man to be stripped to the waist in hot atmospheres.—*Prof. Arthur Gamgee, F.R.S.*: Photographs, drawings, and plans exhibiting the apparatus employed by *Prof. Gamgee* in his research on methods for the continuous (photographic) and quasi-continuous registration of the diurnal curve of the temperature of the animal body.

Dr. G. H. Rodman: A series of stereoscopic radiographs of molluscal shells. Prior to the application of the Röntgen rays to this branch of zoological research, it was necessary to sacrifice the specimen in order to disclose the internal anatomy of the columella and whorls—a course obviously undesirable in the case of a rare and possibly unique shell. In some of the examples shown the radiograph has been so made as to show the equivalent of both horizontal and vertical sections.—*Mr. H. S. Leigh*: Living examples of the leaf insect from the Seychelles, *Phyllium curvifolium*, Serville. The Phylliums afford one of the most striking examples of protective resemblance. The specimens are not only very similar to leaves in shape and colour, but in their peculiar movements imitate the shaking of the leaves. The resemblance to vegetable structures is carried still further, since the eggs bear a marked likeness in shape and colour to certain seeds.—*Prof. J. Cossar Ewart, F.R.S.*: Hybrid between a Prejalsky mare (*Equus prejalskii*) and a Highland pony. This is one of six hybrids bred from wild horses imported from Mongolia. With the exception of the one exhibited, the hybrids are out of pony mares. All six hybrids are males, and two foals out of pony mares by a hybrid bred at Penyculik in 1905 are males. The hybrids support the view that a wild horse of the Prejalsky type took part in the making of domestic horses. Four of the six hybrids were bred at Woburn by his Grace the Duke of Bedford.—*Mr. F. Enock*: Insect intelligence, as exemplified in the life-history of the wood-boring wasps (Crabronidæ). All hymenopterous insects show a high degree of intelligence. One species of Crabro fills its cells with one, and only one, species of insect; another with one kind of beetle; a third with homopterous insects.

Dr. A. S. Woodward, F.R.S.: Photographs, by *Mrs. E. von Kaufmann*, of portions of carcasses of a mammoth and rhinoceros found preserved in petroleum at Starunia, Galicia. These specimens were obtained in an ozokerite mine while sinking a shaft through the deposit of an old marsh which was saturated with petroleum.—*The Director-General, Survey Department, Egypt*: Plans, photographs, and objects illustrating the archaeological survey of that portion of the Nile Valley which will be submerged by the Aswan reservoir when its level is raised. A detailed survey of the valley and the ancient sites is being made, and the anatomical study of all human remains found is being carried on simultaneously with the archaeological investigations. Numerous pre-dynastic cemeteries have been found, and the present evidence shows that in these times Lower Nubia and Egypt formed one ethnological territory, both districts being in the same state of culture. From the first dynasty their history diverges; in Egypt the race remains unchanged, and culture shows a progressive development; in Nubia the race becomes mixed with a strong infusion of negro blood, and culture lags behind that of Egypt.—*Miss M. Helen Tongue*: Bushmen paintings copied by the exhibitor from the caves and rocks in Cape Colony, Orange River Colony, and Basutoland. The paintings, which are found on the walls or roofs of rock shelters or caves, generally in sandstone districts, have been coloured with iron oxides, or with ochres mixed with fat. The date of the work varies. In Cape Colony the latest paintings must be nearly a century old. In Basutoland there may be some of a later date; probably most are older. The pictures have been carefully traced, and the colours and background copied as exactly as possible.